



## **Tectonic Evolution of the Terceira Rift (Azores)**

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The Azores Plateau is located in the Central Atlantic at the Eurasian, Nubian and North-American plates (RRT) Azores Triple Junction. The Terceira Rift (TR) connects the Mid-Atlantic Ridge with the Gloria Fault, hence establishing a transtensional-transform present day plate boundary between the Eurasian and the Nubian plates. Three volcanic islands arose along the TR, Graciosa, Terceira and Sao Miguel. In the geological past, the plate boundary in the Azores area between the Eurasian and Nubian plates was located further south at the East Azores Fracture Zone. The timing of the plate boundary jump, which marks the onset of rifting along the TR, is heavily disputed. Published ages vary from 36 to 1 Ma.

Based on bathymetric data and high-resolution marine 2D multi-channel seismic data acquired during M113 cruise of R/V Meteor in 2014/2015 we discuss the structural evolution of the TR and address the question whether the divergence between both plates is entirely accommodated by the TR.

The central TR between São Miguel and Terceira, also known as Hirondelle Basin, is up to 70 km wide. Rifting created two asymmetric graben sections separated by a rift parallel horst. The north-eastern and south-western graben sections are ca. 4 km and 3 km deep, respectively, and the corresponding graben floors are tilted towards the central horst. Volcanic cones emerged on the central horst and rift shoulders. Bright spots in the basin fill deposits indicate fluid flow out of the volcanic basement. The seafloor is displaced by faults which suggest recent fault displacement.

In the Eastern Graciosa Basin between Terceira and Graciosa Islands the rift narrows to ca. 40 km and shallows to ca. 3200 m water depth. The central horst is no longer detectable. Instead, a buried normal fault and a small escarpment are observed. Shallow faults and block rotation are less pronounced compared to the basins to the south-east and north-west.

The Western Graciosa Basin is about 30 km wide and ca. 3050 m deep. The floor of the wider and deeper north-eastern rift valley dips to the northeast. The southwestern basin is represented by tilted fault blocks.

The relatively undisturbed rift valley between Terceira and Graciosa (Eastern Graciosa Basin) is consistent with a rather low earthquake activity compared to the other TR segments. We therefore conclude that the TR west of Terceira does not accommodate the entire Nubia-Eurasia plate motion. In fact, we assume that tectonic stress is also dissipated in a seismically active area south of the TR where the lineaments of Pico and São Jorge Island are located. Consequently, the new seismic data support the assumption of a diffuse plate boundary in the western half of the TR. Estimating the age of the TR on the basis of fault geometry and present day extension rates supports all those previous studies which suggested a TR age of 1-3 Ma.